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A REVIEW OF COAL-MINE FATALITIES IN INDIANA DURING THE FISCAL YEAR, OCTOBER 1, 1931, TO SEPTEMBER 30, 1932

BY

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A REVIEW OF COAL-MINE FATALITIES IN INDIANA DURING THE FISCAL YEAR, OCTOBER 1, 1931, to SEPTEMBER 30, 1932 1/

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During the fiscal year ended September 30, 1932, there were 27 fatalities in the coal mines of Indiana. Four of this number occurred in small mines employing less than 10 men, over which the State Inspection Department has no jurisdiction. In addition to these coal-mine fatalities, an explosives accident in a clay mine resulted fatally to one man.

Tables 1 and 2, which follow, list the fatalities as to cause and occupation.

Table 1. - Fatal accidents by cause, fiscal year ended September 30, 1932

Cause (underground)	Number	Percent of total
Falls of roof	11	40.8
Falls of coal	--	--
Mine cars	3	11.1
Locomotives	1	3.7
Electricity	5	18.5
Gas and dust explosions	1	3.7
Mine fires	--	--
Explosives	--	--
Mining machines	1	3.7
Loading machines	--	--
Suffocation (other than fires and explosions)..	--	--
Animals	--	--
Falling objects	--	--
Miscellaneous	2	7.4
Shaft	--	--
Falling down shaft	1	3.7
Cage	2	7.4
Material falling down shaft	--	--
Miscellaneous	--	--
Surface	--	--
Total	27	100.0

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2/ District engineer, U. S. Bureau of Mines Safety Station, Vincennes, Ind.

Table 2. - Fatal accidents by occupation,
fiscal year ended September 30, 1932

Occupation	Number	Percent	Approximate percentage of employees
Miner	9	33.4+	50.1
Mining machinemen	3	11.1+	5.1
Loading machinemen	1	3.7	4.3
Motorman	1	3.7	3.8
Triprider	1	3.7	3.4
Driver	3	11.1+	2.0
Tracklayer	-	--	--
Laborer	-	--	--
Trapper	-	--	--
Superintendent or owner	2	7.4	.5
Mine boss	1	3.7	.5
Room boss	1	3.7	.8
Motor or parting boss .	-	--	--
Fire boss	-	--	--
Surveyor	-	--	--
Shotfirer	-	--	--
Timberman	3	11.1	1.5
Shotrunner	-	--	--
Cager	-	--	--
Electrician	1	3.7	1.5
Pumper	-	--	--
Driller	-	--	--
Miscellaneous	-	--	--
Top labor	1	3.7	8.1
Total	27	100.0	

Referring to table 1 it will be observed that falls of roof ranks first, with 40.8 percent of the fatalities; electricity ranks second, with 18.5 percent; and mine cars third, with 11.1 percent of the fatalities.

By referring to the last columns of table 2 it will be seen that the fatality rate among superintendents or owners of mines for the fiscal year was considerably higher than for any other classification, considering the number engaged; this was because the owners of two small mines received fatal accidents. Mine bosses and timbermen ranked second, drivers third, and room bosses fourth.

Through the courtesy of A. G. Wilson, chief mine inspector, the fatal accident reports by the deputy mine inspectors for the fiscal year ended September 30, 1932, were reviewed, as well as the evidence brought out at the coroner's inquests, and the information thus obtained has been summarized for each fatality, as follows:

Fatality 1. - The front wheels of a car in which a driver on the night shift was riding, jumped the track. The car struck the wooden leg supporting one end of a railroad iron crossbar, knocked the leg out, and caused the bar to fall. When the man was found, his head was hanging over the end of the car and the railroad rail was resting upon his neck; the steel bar was also resting on a bare machine wire hung along the side of the entry and carrying 250 volts d.c. The workman, who removed the bar from the man's neck, stated that it was charged with electricity, and the report gives the fatality as due to electric shock, although in the absence of definite information to the contrary it is possible that the man may have been choked to death by the bar pressing his neck down on the end of the car. The car itself was of wood and bar-iron construction and was dry.

The report contains no evidence as to what may have caused the car to jump the track--whether it was due to defective track or car, or to some material on the rail, or other cause. There was little clearance on the one side of the track, however, and this points to the desirability of having sufficient clearance where possible, and also of securing the legs, either by cross bracing or by recessing them into the coal rib, so that they will be easily knocked out.

To prevent a recurrence of similar accidents in the future, this company has abandoned the use of wooden legs under steel crossbars and is now drilling hitches into the ribs in which the steel bars are set.

Fatality 2. - The hand of a miner, who was assisting the machine runner in pulling a machine cable into the working place, accidentally came in contact with a bare place on the cable. The man was standing on the rail at the time and received a shock which made him unconscious. The machine cable nips were pulled off the power line as promptly as possible, and artificial respiration was administered, but he could not be revived. His left hand was burned where it came in contact with the bare place on the machine cable.

More careful inspection and repair of trailing cables and the wearing of safety shoes with soles of nonconducting material would probably have saved this man's life.

Fatality 3. - A miner, while attempting to split the end of a piece of fuse with a drill bit, cut the end of his thumb slightly. He paid no attention to the injury other than to wrap the thumb with a piece of friction tape. The next day while helping to move a mining machine, the bar that he was using slipped and he fell up against the coal rib, bruising his shoulder. On the fourth day following the cutting of his thumb, he was obliged to quit work because of pain in his arm and shoulder which he supposed was due to rheumatism. Blood poisoning developed and he died two weeks after receiving the first injury.

This type of accident points to the desirability of reporting all accidents at the time they occur, irrespective of whether they may be considered trivial, and applying first-aid treatment. If the shots in this mine had been fired electrically, this particular accident probably would not have occurred.

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Fatalities 4 and 5. - Two men while loading coal at the face of an entry were killed by a large fall of rock. The rock was approximately 9 feet long by 11 feet wide by 12 inches thick and weighed about 4 or 5 tons. There was a water slip at the face, and the loading out of the broken coal had removed the support from one side of the rock, permitting it to fall; the rock was of weak texture and broke into a number of pieces when it fell.

The roof in this section of the mine is generally good, and the nearest timber to the face of the entry where the fatalities occurred was back 26 feet. The mine foreman and part owner of the mine had visited this working place shortly before the men started to work in it and had loaded out some loose rock that had been taken down on the last day the mine worked, which was 4 days before the accident. At the time he loaded out this rock he sounded the roof with a pick and thought it to be safe.

Without question this mass of rock was loose at the time the boss sounded it, but due to the fact that it was of a soft clod nature and of such large quantity, sounding alone with a pick might give little indication as to its actual condition. However, had he used the vibration method of testing he doubtless would have felt vibration in the piece of rock while striking it with the pick and probably would then have taken the necessary precautions to make the place safe. The vibration method of testing is simply holding the tips of the fingers of one hand against the rock to be tested while it is struck with a pick or tool in the other hand.

Unquestionably the two men who were killed failed to inspect the place carefully before they started to work or during the period while at work, otherwise they would have seen the danger and would either have taken the rock down or made it safe by timbering.

Fatality 6. - While pushing an empty car on a parting, a driver was instantly killed by a fall of rock.

The piece of rock that fell was about 4 feet long by 3 feet wide by 1 foot 4 inches thick at the thickest place. The parting on which the accident occurred is 109 feet long and 12½ feet wide and no timbering had been done on it with the exception of a single bar near one end. The top throughout the parting appeared to be good. The report does not state when the roof was last inspected, but presumably it had not been carefully inspected during the previous shift. Track partings are usually given little inspection or attention, and it is surprising that accidents of this type do not occur frequently.

Fatality 7. - A machineman riding in an empty car behind a locomotive jumped out of the car when the trip ran away and in so doing, stumbled and fell under the wheels of the car, receiving injuries from which he died.

The locomotive had been left at the shaft bottom for repairs to the controller and brakes. The motor repairman had made some minor repairs to the controller, had gone to the surface for repair parts for the brakes, and had intended to test the locomotive before it was placed in service. Meanwhile the motor boss came to the shaft bottom to get a locomotive to help push the main-line empty trip up a hill. Finding the locomotive that was being repaired in front of that he ordinarily used for this purpose he took it instead, not knowing its condition, as there were no markings to indicate that it was in bad order.

While pushing the empty trip, and just before reaching the parting, a wheel came off the fourth car from the end of the trip. The trip was stopped, the last four cars were cut off, and the main-line locomotive continued on into the parting with the balance of the cars. The motor boss, with the aid of a trapper, was trying to put the wheel back on the car when two machinemen, who had finished their cutting earlier than usual and were on their way to the shaft bottom, came along and helped him with it. He then offered them a ride, telling them to get into the empty car next to the locomotive, and started out for the shaft bottom, following the main-line loaded trip that had just passed. They had gone only a short distance and were traveling at rather high speed when the controller arched and flamed, presumably as the motor boss moved it over onto the last notch. He made no attempt to shut off the motor or to pull off the trolley wheel for fear of being burned from the electric arc; instead he jumped from the moving locomotive, and received some minor injuries to one foot.

The machinemen riding in the empty car behind the locomotive, seeing the flash and the motor boss jump, became frightened and jumped from the car. The first man jumped into a shelter hole and was not injured. The second man, however, jumped off between two shelter holes where there was only the average amount of clearance, and stumbled and fell back under the cars, receiving injuries from which he died. There were 5 feet of clearance between the rail and the rib at the point where the second man jumped, but there was a piece of rail and some gob material on the road at this point, and it is probable that he stumbled over the rail or the refuse material.

This fatality was due to several errors or failure on the part of either the company or employees. First of all the motor repairman should have marked the locomotive "bad order" as soon as he took it to the bottom for repairs, and in this case a suitable tag should have been tied to the controller to make sure that no one would attempt to use it while he was on top for repair parts. The company should have some definite system in marking bad-order equipment and releasing it upon completion of repairs.

Second, the motor boss was apparently traveling at a greater speed than was safe while transporting men.

Third, apparently the motor boss lost his head when the controller flamed and jumped off the locomotive instead of pulling the trolley off the wire and applying the brakes.

Fourth, the refuse material and the rail along the side of the entry probably caused the man to stumble and fall under the car wheels, which points clearly to the danger of stumbling hazards such as timbers, rails, refuse, or similar material along the sides of haulage roads.

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Fatality 8. - A mine foreman was killed upon being struck by a moving empty car near the shaft bottom and was thrown into a moving trip of empty cars on an adjoining track.

The bottom arrangement at this mine is the usual one for this field where self-dumping cages are used. The loaded cars are caged on one side and the empty cars are run by gravity from the cage to the storage tracks. There is a double crossover switch or diamond on the bottom on either side of the shaft so that both empty and loaded cars may be switched to either track.

In this instance, since a trip of empty cars was being pulled out of the left storage track, the cars coming from both cages were probably being thrown onto the right track where the boss was standing. Just why he stood on the track, knowing that the cars were being dropped down into storage, is not known. Doubtless he lost sight of the fact that the crossover switch had been thrown so that cars from both cages would pass down onto the track on which he was standing. There was ample clearance between the tracks at this point, and if he had stood between the tracks instead of on them he would not have been hit.

There should be a rule at this mine, as well as at all other mines, against standing or walking on the track or either side of the shaft bottom, and the rule should be rigidly enforced; the foreman should set the example by living up to the rule himself, and caution signs should be posted calling attention to this rule.

Fatality 9. - A triprider was caught between a car and a locomotive while making a flying switch onto a parting.

It was the custom for the motorman at this mine to cut the locomotive loose from the empty trip when approaching the parting and to run ahead with the locomotive onto the loaded track, depending upon the switchman at the parting to throw the switch to the empty track for the oncoming empty cars. On the day of the accident the main-line trip was blocked by a gathering locomotive on the parting and the motorman was obliged to stop his trip and wait for the gathering locomotive to "get in the clear". While waiting, his triprider walked ahead to the loaded trip and waited there for the main-line locomotive.

After receiving the signal to proceed the motorman cut off the empty cars at the usual point and ran the locomotive ahead to the loaded trip, expecting the switchman to throw the switch to the empty track after the locomotive had passed, as was the custom. There were 4 or 5 men at the switch as he passed, and he evidently supposed one was the switchman and would throw the switch. In this instance, however, no one had thrown the switch, and just as he was slowing the locomotive toward contact with the loaded trip so that the triprider could make the coupling the empty trip that had followed in on the loaded track struck the locomotive and crushed the triprider between the locomotive and the loaded cars. The report does not state whether or not the switchman was at his usual post or why the switch was not thrown in accordance with the usual custom.

Flying switches have been responsible for many accidents. They could be avoided if three-track partings were used in the place of those with two tracks; this would give a free passing track and permit the motorman to back his cars, either loaded or empty, onto the parting. Where this is not possible and it is necessary to make flying switches it would be safer to use a switch electrically controlled and operated by the motorman, with a signal light on the switch stand to show which way the switch is thrown; in this way responsibility for throwing the switch would be entirely upon the motorman, and he would have definite knowledge of the position to which the switch had been thrown. Such switches have been on the market for several years and have proved satisfactory. Flying switches should not be allowed in or around any mine because they are decidedly unsafe and entirely unnecessary.

Fatality 10. - A timberman was killed by a fall of rock while standing on the entry approximately 60 feet back from the face.

The roof in this mine requires close timbering. At the time of the accident the timberman had been setting a crossbar near the face and had gone back along the entry to get some cap pieces with which to wedge the crossbar. While he was standing talking to another workman a piece of rock approximately 4 by 5 feet fell out between two crossbars, striking the timberman and killing him.

The report does not state when the roof along the entry had been last inspected. It probably had not been closely inspected during the previous shift or on the shift on which the accident occurred. The area at or near the face is usually supposed to be kept under careful supervision by the workman, but the vast expanse of open territory away from the face frequently receives little or no attention. It is fortunate that so few accidents occur in these places away from the faces.

Fatality 11. - A miner 75 years of age received injuries from a fall of rock from which he died a week later.

The report states that this man had drilled a shot hole up into the roof, which ordinarily was good, and had thus loosened a piece of slate of about 3 inches in maximum thickness and approximately 5 feet wide and 8 feet long. The rock was apparently supported by some top coal. The man who was killed and his partner had just finished loading a car of coal. The partner went back to the crosscut to eat his lunch while the other man remained at the face to pull down the loose piece of slate. The partner is said to have cautioned the man to set some posts under the loose rock to protect himself while taking down the top coal; however, he did not set the posts but stood under the rock while working down the supporting top coal. As soon as the support afforded by the top coal was removed, the rock fell and crushed the miner. The report further states that the side of the room on which this miner was working was not timbered as close to the face as was the other side. The room boss, who was in an adjoining room, heard the rock fall and the man call for help. The report does not state whether or not the boss had visited this place prior to the accident on the day that it occurred.

The victim, being 75 years of age, no doubt had more than the average years of experience. The fact that he had drilled into the roof and thus weakened it and that his timbering lagged behind his partner's on the other side of the room would indicate carelessness on his part and also lack of supervision on the part of the company. He undoubtedly was aware of the danger in proceeding to do the work as he did, and particularly so since he had been cautioned by his partner to set safety posts under the loose rock before starting the work. It is possible that because of his advanced age he may have had difficulty in keeping up with his partner, who was a younger man, and for this reason he had taken chances while doing his work that he would not have taken otherwise. Men of advanced years should be placed in a section of the mine where the turn is not as good as it is in other sections, and it would appear that all men in a place should work together at least insofar as keeping the entire place in a relatively safe condition is concerned.

Fatality 12. - A miner became sick while wedging down some coal that had been shot the night before. His partners, who were working with him, told him to go back from the face a little distance and rest while they finished loading the car. After the car was loaded these two men went back to see him, and he told them that he was still too sick to work; he went to the surface on their advice while they remained in the working place during the balance of the day and apparently felt no illness as a result of working in the place alleged to have bad air.

The next day the man who was ill died of pneumonia; the autopsy gave the cause of his death as acute lobar pneumonia resulting from breathing carbon monoxide. Inasmuch as the two men who were working with this man felt no ill effects from carbon monoxide or any other cause and since the place was shot the evening before and at least 12 hours had elapsed from the time the shots were fired until the man started to work in the morning, it is questionable whether the carbon monoxide remaining in the place as the result of shooting the night before was sufficient to have brought on pneumonia.

The coal at this mine is all undercut by machine and is shot with black powder and fuse by shotfirers at the end of the shift. Air samples were collected in this working place and showed normal mine air and no carbon monoxide. However, samples of air collected on the day following that on which the alleged gassing occurred would give little evidence as to the condition on the day previous, as the mine is fairly well-ventilated and any carbon monoxide or other gas, if present, would be very likely to have disappeared by the time the samples were taken.

The report does not state how the coroner's physician arrived at his conclusion as to carbon monoxide poisoning. The coroner's report merely states that he arrived at his conclusion as a result of the autopsy and other evidence obtained.

Fatality 13. - At a small mine employing fewer than 10 men and therefore not under the State mining law the cage at the hoisting shaft did not come up into the landing properly when a car of coal was hoisted. It was impossible to pull the car off the cage and the owner and an employee unloaded the car while it was still on the cage. After unloading the car the owner got into it while it was still on the cage and told the hoisting engineer to pull the cage up so that he could see where it was binding or what was preventing it from coming up into the landing. As the hoisting engineer caused the engine to pull on the rope the latter slipped through the clips by which it was attached to the cage, and the cage fell to the bottom of the shaft, killing the owner of the mine.

It is said that the rope had been attached by five clips; this is an ample number and had they been fastened tightly, without doubt they would have held the rope securely to the cage. However, probably the bolts in the clips had worked loose, and when the extra stress was put on the rope in an endeavor to pull the cage up to the landing the rope had slipped through the clips, permitting the cage to fall. Doubtless previous jerkings on the rope had already caused it to slip so that only a small additional pull was necessary to cause the rope to come loose.

Without question this accident would not have happened had the cage and rope been properly inspected as required by law at mines employing more than 10 men. Apparently the cage was not equipped with safety catches to hold the cage if the rope broke or came loose from the cage; the mining law provides that, where more than 10 men are employed, all cages on which men ride shall be so safeguarded. Frequently small mines are inadequately equipped and operated insofar as safety is concerned.

Fatalities 14 and 15. - A room boss and a timberman were instantly killed by a fall of slate at the face of an entry while attempting to set a crossbar.

The fallen rock was 30 feet long, 9 feet 6 inches wide, and 5 feet 7 inches in maximum thickness. The rock had been supported outby the point where they were attempting to set the bar by three crossbars 8 to 10 feet apart. The men evidently knew of the danger but had not taken the necessary precaution to set safety posts to furnish support to the rock while the crossbar was being set. There is also no question but that too much dependence was placed on the three crossbars that supported this large mass of loose rock. The rock had apparently swung the other bars out of place, letting the entire mass fall.

This accident was unquestionably due either to carelessness or to lack of knowledge on the part of the face boss as to how work of this kind might

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be done with reasonable safety; it points to the desirability of having definite standards for the setting of safety posts to offer the necessary protection while permanent timbering is being done under dangerous rock.

Fatality 16. - An assistant electrician was electrocuted while hanging an electric cable carrying 240 volts a.c. The cable had been knocked down during the day shift.

Before beginning the work the chief electrician had instructed the assistant to pull out the switch and cut the current off the cable, and he had done so at the time. The switch was only 8 feet from the place where the electrician was working, and for some unexplained reason he threw it in again after he had started to work. Since the lights at the shaft bottom were connected to the circuit on which he was working it is possible he threw the switch back in to obtain more light than his carbide lamp afforded. The wire stretcher he was using to take the slack out of the cable cut through the insulation, so that as he was standing on the rail and wore hobnail shoes and also as the wire stretcher was made of metal, he formed a direct contact from the electric cable to the rail.

This is a case of direct violation of instructions. The man had been working at this type of work for a number of years and was personally aware of the hazard. Had he been wearing safety shoes with insulated soles rather than the hobnail leather shoes, he might have had sufficient insulation between his body and the rail not to have received the shock.

Fatality 17. - A driver getting on the front end of a moving loaded car was caught between the car and a boulder projecting from the roof and received injuries from which he died about 6 weeks later.

The practice of riding on the front end of loaded cars, although more or less general, is extremely dangerous and is prohibited in many mines, the drivers being required to ride on the back bumper. Abrupt changes of contour in the roof also offer a great hazard on haulage roads. It would pay many mines to go to considerable trouble and expense to remove them.

In this case the boulder either should have been taken down, illuminated by an electric light or whitewashed, or otherwise treated to call attention to the hazard.

Fatality 18. - A timberman was crushed by a fall of rock at the face of a room while preparing to make the place safe by taking down a loose rock; he had apparently neglected to protect himself by setting safety posts before starting to wedge down the rock. The piece of rock that fell was 7 feet long by 5 feet wide and was 8 inches thick at the thickest point.

Definite standards covering the safe way of doing work of this kind should be adopted at all mines and should be rigidly enforced.

Fatality 19. - A miner was instantly killed, and his brother who was working with him loading a car of coal at the face of an entry was seriously injured by a fall of rock.

The accident occurred at 9:00 a.m., just as they were finishing loading the car. The rock was 8 feet wide by 10 feet long and 4 to 5 inches thick and weighed several tons. Doubtless loading out the coal at the face had removed some of the support under the rock, permitting it to fall. The report does not state whether the men had examined the roof themselves before starting to work; neither does it state whether or not the fire boss had examined the place and reported the dangerous condition of the rock following his examination before the beginning of the day shift. Unquestionably the men could have recognized the dangerous condition of the rock had they properly tested it before starting to work. If they had done this and knew it was loose they may have been working under the mistaken idea that they could tell how long it would be safe to work under it before it fell.

There should be a definite rule requiring men to examine their roof carefully before beginning work and also requiring the setting of safety posts at the face before beginning to load the coal. Had such a rule been in force and obeyed this accident might have been prevented.

Fatality 20. - A machineman was killed by a fall of rock which occurred just after he had finished cutting the face of the room and was preparing to cut a crosscut a short distance back from the face.

It had been known that the rock was dangerous, and a timberman was in the place where the accident occurred at the time and had just taken a measurement before cutting a post to make it secure.

This accident was due to the fairly prevalent fallacy of permitting men to work under dangerous roof, with the idea that its fall may not take place immediately, and could have been avoided if rules had been enforced and the men required to stay out from under the loose rock until it had been made secure.

Fatality 21. - A miner at a small mine employing fewer than 10 men was killed by electric shock when he slipped and fell on a bare machine wire hung along the side entry.

The entry at this point was 24 feet wide, but because of gob material along the side of the entry the wires had been hung on posts set only 19 inches from the rail. Had the wires been set back at a safe distance this accident might not have occurred. The report further states that the workman who extricated the man from the wires merely fanned him until additional help came, although at the time he was removed from the wires he was still gasping for breath. No attempt was made by anyone to administer artificial respiration, and when the doctor arrived the man was pronounced dead. It is possible in this instance that had the man who took him off the wire known how to administer artificial respiration the victim might have been saved.

With the common use of electricity in mines, even small ones employing fewer than 10 men, it is very important that all workmen have some knowledge of first aid and particularly the application of artificial respiration. The use of bare power lines in mines without protecting them, while more or less universal practice, is dangerous and should not be allowed.

Fatality 22. - Two topmen pulled a car of dirt from a cage at the dirt landing in the tipple and after unloading it pushed it back to place it on the cage, but they did not observe whether the cage was still at the landing.

In this instance the cage had been lowered to the bottom of the shaft, and instead of pushing the car onto the cage the men pushed it into the shaft, one of the men falling with it and being instantly killed. The report states that there was no gate at this landing but that after the accident a gate had been installed. All shaft landings should be amply protected by gates and fencing to prevent men from falling into the shaft or from pushing empty cars or allowing material to fall into the shaft. Each year there are many accidents of this kind in which the men, thinking that the cage was still at the landing, have pushed cars into the shaft where no gates had been installed or where the gates had been left open; and when gates are placed they are of little use unless they are kept closed at all times, except when cars are being put on or off the cage or when men are getting on or off the cage. At many mines gates are installed that are automatically kept closed, except when the cage is at the landing.

Fatality 23. - A pumpman and general utility man was killed by having his leg caught in the propeller chain of a moving machine truck.

The man was moving a mining machine from a room out onto the entry, and just as he passed over the knuckle of a rather steep down grade the power went off the machine, which began to coast downhill toward a mule a driver had left standing on the entry a short distance ahead. Apparently the man, thinking he would not be able to stop the machine in time, had stepped off the truck to avoid hitting the mule; but owing to the fact that the track at this point had been lowered into the fire clay bottom, leaving a sloping shoulder on each side of the track which was damp and slippery, the man in stepping off onto this shoulder lost his footing and one leg was caught in the propeller chain. About the time the man stepped off the truck, the pit boss who was standing close by saw there was danger that the truck would hit the mule and got it out of the way. In his testimony the mule driver, who had left the mule standing on the entry, stated that he had seen the machine cable on the track and to avoid running over it with a car on his way out had gone back and taken the nips off the power wire, apparently just about the time the man started down the hill with the mining machine.

Unquestionably this accident could have been avoided had the entry been leveled off when the track was cut down into the bottom and thus eliminated the slipping hazard that caused the man to get his leg into the propeller chain. In addition to this, it is unwise for a driver or anyone else to take the nips off the trailing cable of a power unit without first notifying the man or men who are operating the unit. In many mines it is now required that where a cable crosses a haulage road it must be hung overhead to avoid the possibility of being caught by a car or locomotive. Hooks for this purpose are placed in the roof at the desired points.

Fatality 24. - A loading-machine runner was killed by a fall of rock at the face of a room. The man was operating a Joy loading machine and had knocked out some timbers in the way of the machine; shortly after he had taken out the timbers a piece of rock 18 feet long, 18 inches wide, and 9 inches thick fell on him, killing him instantly. His assistant stated that before taking out the timbers both had sounded the top and it seemed to be all right. The timberman stated he had set the timber the day before the accident and that on the morning of the accident, before the loading machine had been taken into the room, he had visited the place and saw that some of the timber had been taken out to make room for the machine. He stated that he had also sounded the roof at that time and it seemed fairly good. Evidently the roof had needed the timbers under it or the timberman would not have set them the day before; and knocking them out without first taking the precaution to set others to take their place, possibly using a crossbar or two, was hazardous.

While both the timberman and assistant loading-machine operator testified that they had sounded the roof, sounding alone might not indicate the looseness of a piece of rock the size of this one--18 feet long, 18 inches wide, and 9 inches thick. The vibration method of testing should be used; that is, resting the tips of the fingers of one hand against the roof while striking the roof with a bar or pick held in the other. The vibrations set up in the loose rock are transmitted to the fingers, thus giving a warning of looseness even though the sound may not indicate danger.

There should be definite rules at all mechanically operated mines requiring that before knocking out timbers, particularly under loose roof, some other means of roof or side support should be afforded; these rules should be rigidly enforced by the company. Where it is impossible to timber in such a way as to get to the coal with the loading machines it would be far better to move the coal by hand to a point where the machine can get it rather than to take the chance of killing someone.

One mine in Indiana is using long steel crossbars where similar conditions prevail.

Fatality 25. - At a small mine employing fewer than 10 men a miner collapsed on the cage while being hoisted as a result of having breathed powder smoke while attempting to load a car of coal.

The man's head was caught between the cage platform and the shaft timbering, breaking his neck. A new shaker screen had just been installed at this mine and the officials were desirous of giving it a trial. Not having any coal prepared that could be loaded into the cars for this trial, the victim and another miner went into the mine and drilled and shot one hole;

after waiting an hour or more both went inside and began to load a car. However, both began to feel sick after working about 15 minutes and went out to the shaft bottom and started up on the cage. When within about 20 feet of the top of the shaft, which is about 60 feet in depth, one of the men collapsed and fell to the platform of the cage with his head toward the shaft curbing. His head was caught between the platform of the cage and the shaft timbering.

This accident shows the hazard of going back too soon after a shot is fired, particularly where black powder is used, as was the case in this instance; and scores of cage accidents have occurred where men have been caught and killed between the cage platform and shaft timbering; they could be prevented if cages were provided with doors or gates which were always closed while men were being hoisted or lowered.

Fatality 26. - The owner of a small mine employing fewer than 10 men was burned to death by the ignition of methane at the bottom of the shaft.

The owner and his son had just been lowered on the cage to examine the mine for gas before starting to work for the day. The son had a Baby Wolf flame safety lamp and states that he found gas as they stepped off the cage. He claims that he then smothered the lamp by placing it under his jacket, after which he placed it on the floor, sat down and was talking with his father. Suddenly there was a flash; the son jumped into the sump and escaped injury, while the father ran down the entry and received burns from which he died.

No definite explanation is offered as to the cause of the ignition. Both men carried carbide lamps filled with carbide, but neither lamp had any water, although one lamp had some dissolved carbide which might indicate that there was some gas being given off by the lamp. A more probable explanation is that the son may have thought he smothered the flame safety lamp by putting it under his jacket when as a matter of fact gas was still burning up in the gauze of the Baby Wolf flame safety lamp. When the burning gas reached a temperature sufficiently high, it may have ignited the explosive mixture.

This mine is working in the Number Five bed and the shaft is about 190 feet in depth. The practice has been to run the fan only on days that the mine worked. Doubtless the fan had not been operating for a considerable period prior to the time the men went into the mine, and they did not wait a sufficient length of time for the mine to be cleared of explosive gas. Hence, they found the explosive gas at the bottom of the hoisting shaft, which was also the up-cast shaft. This incident has numerous lessons; among them it illustrates one of numerous hazards in having the hoisting shaft in return air.

Fatality 27. - A triprider who was acting as a motorman on an idle day was electrocuted by coming in contact with a trolley wire while trying to put the trolley wheel back on the wire.

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The man who was working with the victim was at a switch a short distance from the locomotive and saw that the other man was having some trouble getting the trolley back on the wire. Suddenly the motorman called. The man at the switch walked back to the locomotive to see what was the trouble, and found him sitting on the seat in the cab with his arm across the controller with his head resting on his arm. Receiving no answer when he spoke to him, the partner called for help; the room boss at the time was about five or six hundred feet down the entry and in response to the calls ran to assist in taking the motorman off the locomotive. At the time the room boss arrived, the victim was gasping for breath, but apparently neither the boss nor the other workman knew how to give artificial respiration, for they merely rubbed and worked his arms and bathed his face for about 5 minutes after taking him off the locomotive. Not being able to revive him, they loaded him into a car and took him to the shaft bottom and again worked on him until the arrival of a doctor who applied artificial respiration. Later a pulmotor was used on him for an hour and 15 minutes without helpful effect.

In this instance probably as much as half an hour elapsed between the time they found the man gasping for breath after receiving the electric shock and the time the doctor arrived. It is essential that artificial respiration be started as soon as possible after an electric shock, and preferably in less than 10 minutes. There was therefore in this case very little chance for the doctor to be of any assistance, but there is a very strong probability that if these men who brought the victim to the surface had known how to apply artificial respiration and had given it immediately after taking him off the locomotive, his life would have been saved.

With the continual increase in the use of electrical equipment underground it is very essential that those working in the mine should have some knowledge of first aid, and particularly of artificial respiration. In fact every person who works in or around any mine should be familiar with the full first-aid course as given by the United States Bureau of Mines.

Fatality 28. - In addition to the coal-mine fatalities enumerated, a fatality occurred in a clay mine in southern Indiana.

In this mine eight dynamite shots were lighted, but all eight failed to fire. On the succeeding day, finding that the eight shots had misfired, eight additional holes were drilled and shot parallel to those that had failed. On the third day while digging with his pick in the broken material that had been shot down by the second round of holes, a man apparently struck the unexploded primer from one of the misfired shots, causing an explosion which resulted in his death.

A fellow workman, who was about 200 feet distant from the man killed, said that the explosion was quite violent and blew out his light. Possibly more explosive than just the primer exploded when the man's pick struck the detonator.

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The report does not give information as to why all eight shots failed to fire, but since fuse was being used it is presumed that failure was due to using deteriorated fuse on all eight shots. Fuse that is allowed to become damp is a fruitful source of misfired shots.

The handling of misfired shots presents many hazards. No criticism is offered as to the method pursued in this case--namely, the drilling and firing of new holes--as it is believed this would be safer than attempting to withdraw the misfired charge. However, after the new holes are fired extreme care should be used in loading out the material shot down to avoid such an occurrence as took place here. At the same time great care should be exercised so that any unexploded primers, "caps", or explosives may be found and not loaded out with the broken material. A very grave hazard exists if unexploded explosives are permitted to pass through the surface plant and possibly ultimately reach the bin or the furnace of a consumer of coal.

CONCLUSION

If careful investigation of an accident is made and the report contains the essential information concerning the underlying causes which led up to it, usually it is not difficult to fix the responsibility for the accident or to determine what might have been done to prevent it. It is not always so easy, however, to recognize and correct these underlying accident causes before the accident occurs, and it is only through a study of the accidents that the necessary foresight or vision may be obtained that will enable mining people to recognize and correct dangerous conditions or practices and thus to take measures to reduce mine accidents.

Some State mine inspection departments now issue monthly mimeographed statements descriptive of the essential factors which entered into the occurrence of the fatal accidents of the coal mines of the State for the month, pointing out what might be done to avoid the accident or accidents. This is a worth-while procedure and one which all State inspection forces might well adopt.